

## CLAIMS

1.           A processing apparatus characterized by  
2 comprising:  
3           a vessel which accommodates a target object;  
4           ultraviolet light-generating means for  
5 outputting ultraviolet light or vacuum ultraviolet light  
6 toward an atmosphere containing radicals in said vessel;  
7           ultraviolet light-receiving means for  
8 receiving the ultraviolet light or vacuum ultraviolet  
9 light passing through the atmosphere; and  
10           analysis control means for obtaining a density  
11 of the radicals in the atmosphere on the basis of an  
12 output signal from said ultraviolet light-receiving  
13 means, to control a process parameter.

2.           A processing apparatus according to claim 1,  
2 characterized in that  
3           said analysis control means obtains an  
4 attenuation amount of the ultraviolet light or vacuum  
5 ultraviolet light passing through the atmosphere on the  
6 basis of the output signal from said ultraviolet  
7 light-receiving means, and obtains the density of the  
8 radicals in the atmosphere from the attenuation amount.

3.           A processing apparatus according to claim 1,  
2 characterized by comprising:  
3           means for intermittently outputting the  
4 ultraviolet light or vacuum ultraviolet light toward the

5 atmosphere and outputting an ultraviolet light  
6 presence/absence signal indicating presence/absence of  
7 the ultraviolet light or vacuum ultraviolet light; and  
8 means for obtaining a difference calculated by  
9 subtracting a light reception amount of said ultraviolet  
10 light-receiving means obtained when the ultraviolet  
11 light or vacuum ultraviolet light is absent from a light  
12 reception amount of said ultraviolet light-receiving  
13 means obtained when the ultraviolet light or vacuum  
14 ultraviolet light is present on the basis of the  
15 ultraviolet light presence/absence signal, and obtaining  
16 the density of the radicals in the atmosphere from the  
17 difference.

4. A processing apparatus according to claim 1,  
2 characterized by comprising means for causing the  
3 ultraviolet light or vacuum ultraviolet light output  
4 from said ultraviolet light-generating means to pass  
5 through a plurality of optical paths and to be received  
6 by said ultraviolet light-receiving means.

5. A processing apparatus according to claim 4,  
2 characterized by comprising modulators arranged to said  
3 optical paths respectively and having modulation  
4 frequencies that are different from each other.

6. A processing apparatus according to claim 1,  
2 characterized in that  
3 said vessel has a window through which the  
4 ultraviolet light passes, and

5                   said window is heated.

7.               A processing apparatus according to claim 1,  
2 characterized in that

3                   said vessel has a window through which the  
4 ultraviolet light passes, and

5                   said window has a cylindrical structure.

8.               A processing apparatus according to claim 1,  
2 characterized by comprising:

3                   temperature measuring means for measuring a  
4 temperature of molecular or atomic radicals in the  
5 atmosphere, and

6                   said analysis control means controls the  
7 process parameter on the basis of the output signal from  
8 said ultraviolet light-receiving means and a measurement  
9 result of said temperature measuring means.

9.               A processing apparatus according to claim 8,  
2 characterized in that said temperature control means  
3 includes

4                   laser beam generating means for generating a  
5 laser beam toward the atmosphere,

6                   laser beam receiving means for receiving the  
7 laser beam passing through the atmosphere; and

8                   analysis means for obtaining an attenuation  
9 amount spectrum of the laser beam passing through the  
10 atmosphere on the basis of an output signal from said  
11 laser beam receiving means, and obtaining a temperature  
12 of molecular or atomic radicals in the atmosphere from a

13 pattern of the attenuation amount spectrum.

10. A processing apparatus according to claim 9,  
2 characterized by comprising:

3 means for intermittently outputting the laser  
4 beam toward the atmosphere and outputting a laser beam  
5 presence/absence signal indicating presence/absence of  
6 the laser beam; and

7 means for obtaining a spectrum of a difference  
8 calculated by subtracting a light reception amount of  
9 said laser beam receiving means obtained when the laser  
10 ultraviolet beam is absent from a light reception amount  
11 of said laser beam receiving means obtained when the  
12 laser beam is present on the basis of the laser beam  
13 presence/absence signal, and obtaining a temperature of  
14 the molecular or atomic radicals in the atmosphere from  
15 a pattern of the spectrum.

11. A processing apparatus according to claim 8,  
2 characterized in that said temperature measuring means  
3 measures a light emission spectrum of the molecular or  
4 atomic radicals in the atmosphere, and obtains a  
5 temperature of the molecular or atomic radicals in the  
6 atmosphere from an obtained spectrum pattern.

12. A processing apparatus according to claim 9,  
2 characterized by comprising means for causing the laser  
3 beam output from said laser beam generating means to  
4 pass through a plurality of optical paths, and to be  
5 received by said laser beam means.

13.           A processing apparatus according to claim 12,  
2 characterized by comprising modulators arranged to said  
3 optical paths respectively and having modulation  
4 frequencies that are different from each other.

14.           A processing apparatus according to claim 9,  
2 characterized in that  
3               said vessel has a window through which the  
4 laser beam passes, and  
5               said window is heated.

15.           A processing apparatus according to claim 9,  
2 characterized in that  
3               said vessel has a window through which the  
4 laser beam passes, and  
5               said window has a cylindrical structure.

16.           A processing apparatus according to claim 1,  
2 characterized in that the radicals are atomic radicals.

17.           A processing apparatus according to claim 16,  
2 characterized in that the atomic radicals include any  
3 one element selected from Si, N, O, F, H, and C.